Appendix C. Source and Accuracy of Estimates

SOURCE OF DATA

Most estimates in this report come from data obtained in November of years 1964 through 1988 in the Current Population Survey (CPS). The Bureau of the Census conducts the survey every month, although this report uses mostly November data for its estimates. The November survey uses two sets of questions, the basic CPS and the supplement.

Basic CPS. The basic CPS collects primarily labor force data about the civilian noninstitutional population. Interviewers ask questions concerning labor force participation about each member 14 years old and over in every sample household.

The present CPS sample was selected from the 1980 decennial census files with coverage in all 50 States and the District of Columbia. The sample is continually updated to account for new residential construction. It is located in 729 areas comprising 1,973 counties, independent cities, and minor civil divisions. About 56,100 occupied housing units are eligible for interview every month. Interviewers are unable to obtain interviews at about 2,500 of these units because the occupants are not home after repeated calls or are unavailable for some other reason.

Since the introduction of the CPS, the Bureau of the Census has redesigned the CPS sample several times to improve the quality and reliability of the data and to satisfy changing data needs. The most recent changes were completely implemented in July 1985.

The following table summarizes changes in the CPS designs for the years for which data appear in this report.

Description of the Current Population Survey

Time period	Number of sample areas	Housing units eligible	
		Interviewed	Not interviewed
1988	729	53,600	2,500
1986	729	57,000	2,500
1982-84	629	59,000	2,500
1980	629	65,500	3,000
1978	614	55,000	3,000
1974-76	461	46,500	2,500
1972	449	45,000	2,000
1968-70	449	48,000	2,000
1964-66	357	33,500	1,500

November 1988 supplement. In addition to the basic CPS questions, interviewers asked supplementary questions in November 1988 about voting and registration.

Estimation procedure. This survey's estimation procedure inflates weighted sample results to independent estimates of the civilian noninstitutional population of the United States by age, sex, race, and Hispanic origin. The independent estimates were based on statistics from decennial censuses of population; statistics on births, deaths, immigration and emigration; and statistics on the size of the Armed Forces. The independent population estimates used from 1981 to the present were based on updates to controls established by the 1980 decennial census. Data before 1981 were based on independent population estimates from the most recent decennial census. For more details on the change in independent estimates, see the section entitled "Introduction of 1980 Census Population Controls" in an earlier report (Series P-60, No. 133).

The estimates in this report for 1985 and later also employ a revised survey weighting procedure for persons of Hispanic origin. In previous years, weighted sample results were inflated to independent estimates of the noninstitutional population by age, sex, and race. There was no specific control of the survey estimates for the Hispanic population. Since then, the Bureau of the Census developed independent population controls for the Hispanic population by sex and detailed age groups. Revised weighting procedures incorporate these new controls. The independent population estimates include some, but not all, undocumented immigrants.

ACCURACY OF ESTIMATES

Since the CPS estimates come from a sample, they may differ from figures from a complete census using the same questionnaires, instructions, and enumerators. A sample survey estimate has two possible types of error: sampling and nonsampling. The accuracy of an estimate depends on both types of error, but the full extent of the nonsampling error is unknown. Consequently, one should be particularly careful when interpreting results based on a relatively small number of cases or on small differences between estimates. The standard errors for CPS estimates primarily indicate the magnitude of sampling error. They also partially measure the effect of some nonsampling errors in responses and enumeration, but do not measure systematic biases in the data. (Bias is the average over all possible samples of the differences between the sample estimates and the desired value.)

Nonsampling variability. Nonsampling errors can be attributed to many sources. These sources include the inability to obtain information about all cases in the sample, definitional difficulties, differences in the interpretation of questions, respondents' inability or unwillingness to provide correct information or to recall information, errors made in data collection such as in recording or coding the data, errors made in processing the data, errors made in estimating values for missing data, and failure to represent all units with the sample (undercoverage).

CPS undercoverage results from missed housing units and missed persons within sample households. Compared to the level of the 1980 decennial census, overall CPS undercoverage is about 7 percent. CPS undercoverage varies with age, sex, and race. Generally, undercoverage is larger for males than for females and larger for Blacks and other races combined than for Whites. As described previously, ratio estimation to independent age-sex-race-Hispanic population controls partially corrects for the bias due to undercoverage. However, biases exist in the estimates to the extent that missed persons in missed households or missed persons in interviewed households have different characteristics from those of interviewed persons in the same age-sex-race-Hispanic group. Furthermore, the independent population controls have not been adjusted for undercoverage in the 1980 census.

For additional information on nonsampling error including the possible impact on CPS data when known, refer to Statistical Policy Working Paper 3, *An Error Profile: Employment as Measured by the Current Population Survey,* Office of Federal Statistical Policy and Standards, U.S. Department of Commerce, 1978; and Technical Paper 40, *The Current Population Survey: Design and Methodology,* Bureau of the Census, U.S. Department of Commerce.

Sampling variability. Sampling variability is variation that occurred by chance because a sample was surveyed rather than the entire population. Standard errors, as calculated by methods described later in "Standard Errors and Their Use," are primarily measures of sampling variability, although they may include some nonsampling error.

Comparability of data. Data obtained from the CPS and other sources are not entirely comparable. This results from differences in interviewer training and experience and in differing survey processes. This is an example of nonsampling variability not reflected in the standard errors. Use caution when comparing results from different sources.

Caution should also be used when comparing estimates in this report, which reflect 1980 census-based population controls, with estimates for 1980 and earlier years, which reflect 1970 census-based population controls. This change in population controls had relatively little impact on summary measures such as means, medians, and percentage distributions, but did have a significant impact on levels. For example, use of 1980 based population controls results in about a 2-percent increase in the civilian noninstitutional population and in the number of families and households. Thus, estimates of levels for data collected in 1981 and later years will differ from those for earlier years by more than what could be attributed to actual changes in the population. These differences could be disproportionately greater for certain subpopulation groups than for the total population.

Since no independent population control totals for persons of Hispanic origin were used before 1985, compare Hispanic estimates over time cautiously.

Note when using small estimates. Summary measures (such as medians and percentage distributions) are shown only when the base is 75,000 or greater. Because of the large standard errors involved, summary measures would probably not reveal useful information when computed on a smaller base. However, estimated numbers are shown even though the relative standard errors of these numbers are larger than those for corresponding percentages. These smaller estimates permit combinations of the categories to suit data users' needs. Take care in the interpretation of small differences. For instance, even a small amount of nonsampling error can cause a borderline difference to appear significant or not, thus distorting a seemingly valid hypothesis test.

Standard errors and their use. A number of approximations are required to derive, at a moderate cost, standard errors applicable to all the estimates in this report. Instead of providing an individual standard error for each estimate, generalized sets of standard errors are provided for various types of characteristics. Thus, the tables show levels of magnitude of standard errors rather than the precise standard errors.

The sample estimate and its standard error enable one to construct a confidence interval, a range that would include the average result of all possible samples with a known probability. For example, if all possible samples were surveyed under essentially the same general conditions and using the same sample design, and if an estimate and its standard error were calculated from each sample, then approximately 90 percent of the intervals from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate would include the average result of all possible samples.

A particular confidence interval may or may not contain the average estimate derived from all possible

Table C-1. **Standard Errors of Estimated Numbers of Persons**

(Numbers in thousands)

Estimate	Total or White	Black	Hispanic
25	10	12	15
50	14	17	22
75	17	20	27
100	20	24	31
250	31	37	48
750	53	64	83
1,000	62	73	95
2,500	97	111	144
5,000	136	145	188
7,500	166	161	209
10,000	190	166	216
15,000	229	142	184
20,000	261	(X)	(X)
25,000	287	(X)	(X)
50,000	371	(X)	(X)
75,000	408	(X)	(X)
100,000	410	(X)	(X)
110,000	401	(X)	(X)
150,000	301	(X)	(X)

X Not applicable.

NOTE: For a particular characteristic, see tables C-5 through C-7 for the factor to apply to the above standard errors.

samples. However, one can say with specified confidence that the interval includes the average estimate calculated from all possible samples.

Some statements in the report may contain estimates followed by a number in parentheses. This number can be added to and subtracted from the estimate to calculate upper and lower bounds of the 90-percent confidence interval. For example, if a statement contains the phrase "grew by 1.7 percent (±1.0)," the 90-percent confidence interval for the estimate, 1.7 percent, is 0.7 percent to 2.7 percent.

Standard errors may also be used to perform hypothesis testing, a procedure for distinguishing between population parameters using sample estimates. The most common type of hypothesis appearing in this report is that the population parameters are different. An example of this would be comparing the voting turnout rates of 1988 and 1984.

Tests may be performed at various levels of significance, where a significance level is the probability of concluding that the characteristics are different when, in fact, they are the same. All statements of comparison in the text have passed a hypothesis test at the 0.10 level of significance or better. This means that the absolute value of the estimated difference between characteristics is greater than or equal to 1.6 times the standard error of the difference.

Standard errors of estimated numbers. There are two ways to compute the approximate standard error, s_x, of an estimated number shown in this report. The first uses the formula

$$s_x = fs \tag{1}$$

where f is a factor from tables C-5 through C-7, and s is the standard error of the estimate obtained by interpolation from table C-1. The second method uses formula (2), from which the standard errors in table C-1 were calculated. This formula will provide more accurate results than formula (1).

$$s_x = \sqrt{ax^2 + bx} \tag{2}$$

Here x is the size of the estimate and a and b are the parameters in tables C-5 through C-7 associated with the particular type of characteristic. When calculating

Table C-2. **Standard Errors of Estimated Percentages: Total or White**

(Bases in thousands)

Base of estimate	Estimated percentage					
	2 or 98	5 or 95	10 or 90	20 or 80	25 or 75	50
25	5.48	8.53	11.74	15.65	16.94	19.56
50	3.87	6.03	8.30	11.07	11.98	13.83
75	3.16	4.92	6.78	9.04	9.78	11.29
100	2.74	4.26	5.87	7.83	8.47	9.78
250	1.73	2.70	3.71	4.95	5.36	6.19
750	1.00	1.56	2.14	2.86	3.09	3.57
1,000	0.87	1.35	1.86	2.47	2.68	3.09
2,500	0.55	0.85	1.17	1.57	1.69	1.96
5,000	0.39	0.60	0.83	1.11	1.20	1.38
7,500	0.32	0.49	0.68	0.90	0.98	1.13
10,000	0.27	0.43	0.59	0.78	0.85	0.98
15,000	0.22	0.35	0.48	0.64	0.69	0.80
20,000	0.19	0.30	0.41	0.55	0.60	0.69
25,000	0.17	0.27	0.37	0.49	0.54	0.62
50,000	0.12	0.19	0.26	0.35	0.38	0.44
75,000	0.10	0.16	0.21	0.29	0.31	0.36
100,000	0.09	0.13	0.19	0.25	0.27	0.31
110,000	0.08	0.13	0.18	0.24	0.26	0.29
150,000	0.07	0.11	0.15	0.20	0.22	0.25

Table C-3. **Standard Errors of Estimated Percentages: Black**

(Bases in thousands)

Base of estimate	Estimated percentage					
	2 or 98	5 or 95	10 or 90	20 or 80	25 or 75	50
25	6.63	10.32	14.20	18.93	20.50	23.67
50	4.69	7.30	10.04	13.39	14.49	16.74
75	3.83	5.96	8.20	10.93	11.83	13.67
100	3.31	5.16	7.10	9.47	10.25	11.83
250	2.10	3.26	4.49	5.99	6.48	7.48
750	1.21	1.88	2.59	3.46	3.74	4.32
1,000	1.05	1.63	2.25	2.99	3.24	3.74
2,500	0.66	1.03	1.42	1.89	2.05	2.37
5,000	0.47	0.73	1.00	1.34	1.45	1.67
7,500	0.38	0.60	0.82	1.09	1.18	1.37
10,000	0.33	0.52	0.71	0.95	1.02	1.18
15,000	0.27	0.42	0.58	0.77	0.84	0.97

NOTE: For a particular characteristic, see table C-5 or C-6 for the factor to apply to the above standard errors.

standard errors for numbers from cross-tabulations involving different characteristics, use the factor or set of parameters for the characteristic which will give the largest standard error.

Illustration. Table 7 of the report shows that 2,520,000 Blacks age 18 years and over are not enrolled in school in 1988. Using formula (1) with f = 1.00 from table C-6 and s = 111,000 interpolating from table C-1, the standard error of 2,520,000 is

$$s_x = (1.00)(111,000) = 111,000$$

Alternatively, using formula (2) with a = -0.000284 and b = 5,602 from table C-6, the approximate standard error is

$$s_x = \sqrt{(-0.000284)(2,520,000)^2 + (5,602)(2,520,000)} = 111,000$$

So the 90-percent confidence interval for the number of Blacks 18 years and over not enrolled in school in 1988 is from 2,342,000 to 2,698,000, i.e., 2,520,000 ± 1.6(111,000). Therefore, a conclusion that the average estimate derived from all possible samples lies within a range computed in this way would be correct for roughly 90 percent of all possible samples.

Standard errors of estimated percentages. The reliability of an estimated percentage, computed using sample data for both numerator and denominator, depends on the size of the percentage and its base. Estimated percentages are relatively more reliable than the corresponding estimates of the numerators of the percentages, particularly if the percentages are 50 percent or more. When the numerator and denominator of the percentage are in different categories, use the factor or parameter from tables C-5 through C-7 indicated by the numerator.

The approximate standard error, $s_{x,p}$, of an estimated percentage can be obtained by use of the formula

$$s_{x,p} = fs \qquad (3)$$

In this formula, f is the appropriate factor from tables C-5 through C-7, and s is the standard error of the estimate obtained by interpolation from table C-2, C-3, or C-4.

Table C-4. **Standard Errors of Estimated Percentages: Hispanic**

(Bases in thousands)

Base of estimate	Estimated percentage					
	2 or 98	5 or 95	10 or 90	20 or 80	25 or 75	50
25	8.60	13.39	18.44	24.58	26.61	30.73
50	6.08	9.47	13.04	17.38	18.82	21.73
75	4.97	7.73	10.64	14.19	15.36	17.74
100	4.30	6.70	9.22	12.29	13.30	15.36
250	2.72	4.24	5.83	7.77	8.41	9.72
750	1.57	2.45	3.37	4.49	4.86	5.61
1,000	1.36	2.12	2.91	3.89	4.21	4.86
2,500	0.86	1.34	1.84	2.46	2.66	3.07
5,000	0.61	0.95	1.30	1.74	1.88	2.17
7,500	0.50	0.77	1.06	1.42	1.54	1.77
10,000	0.43	0.67	0.92	1.23	1.33	1.54
15,000	0.35	0.55	0.75	1.00	1.09	1.25

NOTE : For a particular characteristic, see table C-7 for the factor to apply to the above standard errors.

Table C-5. "a" and "b" Parameters for Characteristics: Total or White

Characteristic	a	b	f[1]
Voting, registration, reasons for not voting or registering:			
CPS counts	-0.000021	3,827	1.00
Official counts	(X)	(X)	(X)
Citizenship, household relationship, family heads by presence of children, marital status, duration of residence, tenure, education level, employment status, family income of persons and occupation group	-0.000021	3,827	1.00
Characteristics of all persons:			
Marital status	-0.000030	5,320	1.39
Education of persons	-0.000015	2,745	0.72
Education of family head	-0.000012	2,111	0.55
Employment, not in labor force, occupation	-0.000016	2,763	0.72
Unemployment	-0.000015	2,619	0.68
Persons by family income	-0.000025	4,477	1.17
Duration of residence tenure	-0.000030	5,320	1.39
Household relationships:			
Head, spouse of head	-0.000012	2,111	0.55
Nonrelative or other relative of head	-0.000030	5,320	1.39

X Not applicable.
[1]Factors to be applied to tables C-1 and C-2, to obtain approximate standard errors of characteristics.
Note: For standard errors of historical data multiply parameters and factors by:

Standard error	1964	1966	1968-80	1982-86
a and b	0.99	1.55	0.66	0.84
f	0.99	1.24	0.81	0.92

Table C-6. "a" and "b" Parameters for Characteristics: Black

Characteristic	a	b	f[1]
Voting, registration, reasons for not voting or registering:			
CPS counts	-0.000284	5,602	1.00
Official counts	(X)	(X)	(X)
Citizenship, household relationship, family heads by presence of children, marital status, duration of residence, tenure education level, employment status, family income of persons and occupation group	-0.000284	5,602	1.00
Characteristics of all persons:			
Marital status	-0.000387	7,630	1.36
Education of persons	-0.000157	3,087	0.55
Education of family head	-0.000097	1,907	0.34
Employment, not in labor force, occupation	-0.000140	2,763	0.49
Unemployment	-0.000153	3,011	0.54
Persons by family income	-0.000260	5,118	0.91
Duration of residence tenure	-0.000387	7,630	1.36
Household relationships:			
Head, spouse of head	-0.000097	1,907	0.34
Nonrelative or other relative of head	-0.000387	7,630	1.36

X Not applicable.
[1]Factors to be applied to tables C-1 and C-3, to obtain approximate standard errors of characteristics.
Note: For standard errors of historical data multiply parameters and factors by:

Standard error	1964	1966	1968-80	1982-86
a and b	0.99	1.55	0.66	0.84
f	0.99	1.24	0.81	0.92

Table C-7. **"a" and "b" Parameters for Characteristics: Hispanic**

Characteristic	a	b	f[1]
Voting, registration, reasons for not voting or registering:			
CPS counts	-0.000737	9,441	1.00
Official counts	(X)	(X)	(X)
Citizenship, household relationship, family heads by presence of children, marital status, duration of residence, tenure education level, employment status, family income of persons and occupation group	-0.000737	9,441	1.00
Characteristics of all persons:			
Marital status	-0.001004	12,859	1.36
Education of persons	-0.000406	5,203	0.55
Education of family head	-0.000251	3,214	0.34
Employment, not in labor force, occupation	-0.000364	4,657	0.49
Unemployment	-0.000396	5,075	0.54
Persons by family income	-0.000673	8,625	0.91
Duration of residence tenure	-0.001004	12,859	1.36
Household relationships:			
Head, spouse of head	-0.000251	3,214	0.34
Nonrelative or other relative of head	-0.001004	12,859	1.36

X Not applicable.
[1]Factors to be applied to tables C-1 and C-4, to obtain approximate standard errors of characteristics.
Note: For standard errors of historical data multiply parameters and factors by:

Standard error	1972-74	1976-80	1982-84	1986
a and b	0.79	0.44	0.56	0.84
f	0.89	0.66	0.75	0.92

Alternatively, formula (4) will provide more accurate results:

$$s_{x,p} = \sqrt{bp(100 - p)/x} \qquad (4)$$

Here x is the total number of persons, families, households, or unrelated individuals in the base of the percentage, p is the percentage ($0 \leq p \leq 100$), and b is the parameter in tables C-5 through C-7 associated with the characteristic in the numerator of the percentage.

Illustration. Table 2 shows that 36.7 percent of the 21,092,000 Whites age 18 through 24 reported that they did vote in 1988. Using formula (3) with f = 1.00 from table C-5 and s = 0.6 interpolating from table C-2, the standard error for 36.7 percent is approximately

$$s_{x,p} = (1.00)(0.6) = 0.6$$

Alternatively, using formula (4) and b = 3827 from table C-5, the standard error of 36.7 percent is approximately

$$s_{x,p} = \sqrt{(3,827)(36.7)(100\text{-}36.7)/21,092,000} = 0.6$$

The 90-percent confidence interval for the estimated percentage of Whites age 18-24 who voted in 1988 is from 35.7 to 37.7 percent, i.e., 36.7 percent ± (1.6)(0.6).

Standard error of a difference. The standard error of the difference between two sample estimates is approximately equal to

$$s_{x\text{-}y} = \sqrt{s_x^{\,2} + s_y^{\,2}} \qquad (5)$$

where s_x and s_y are the standard errors of the estimates, x and y. The estimates can be numbers, percentages, ratios, etc. This will represent the actual standard error quite accurately for the difference between estimates of the same characteristic in two different areas, or for the difference between separate and uncorrelated characteristics in the same area. However, if there is a high positive (negative) correlation between the two characteristics, the formula will overestimate (underestimate) the true standard error.

Illustration of the computation of the standard error of a difference. Table 1 shows that in 1988, 65.2 percent of the 84,531,000 males were registered. Table 1 also shows that 67.8 percent of the 93,568,000 females were registered. The apparent difference between the percent of males and females who registered is 2.6 percent. Using formula (4) with b = 3827 from table C-5, the approximate standard error s_x for 65.2 percent is 0.3. The standard error s_y for 67.8 percent is 0.3 (b = 3827). Using formula (5), the standard error for the estimated difference of 2.6 percent is about

$$s_{x\text{-}y} = \sqrt{(0.3)^2 + (0.3)^2} = 0.4$$

This means that the 90-percent confidence interval around the difference is from 2.0 to 3.2 percent, i.e., 2.6 ± (1.6)(0.4). Because the interval does not contain zero, we can conclude with 90-percent confidence that the percentage of registered males is larger than the percentage of registered females.

Table C-8. **State Voting Parameters**

States	a	b
Alabama	−0.001510	4,448
Alaska	−0.001444	487
Arizona	−0.001609	3,616
Arkansas	−0.001388	2,402
California	−0.000366	7,048
Colorado	−0.001522	3,636
Connecticut	−0.001680	4,117
Delaware	−0.001531	712
District of Columbia	−0.001436	698
Florida	−0.000327	2,826
Georgia	−0.001304	5,567
Hawaii	−0.001523	1,107
Idaho	−0.001384	968
Illinois	−0.000382	3,285
Indiana	−0.001465	5,972
Iowa	−0.001293	2,793
Kansas	−0.001294	2,326
Kentucky	−0.001426	3,920
Louisiana	−0.001412	4,561
Maine	−0.001411	1,218
Maryland	−0.001572	5,198
Massachusetts	−0.000372	1,683
Michigan	−0.000388	2,608
Minnesota	−0.001467	4,558
Mississippi	−0.001359	2,523
Missouri	−0.001454	5,463
Montana	−0.001310	790
Nebraska	−0.001230	1,446
Nevada	−0.001826	1,277
New Hampshire	−0.001744	1,290
New Jersey	−0.000359	2,086
New Mexico	−0.001288	1,312
New York	−0.000318	4,341
North Carolina	−0.000374	1,714
North Dakota	−0.001181	580
Ohio	−0.000357	2,872
Oklahoma	−0.001267	3,138
Oregon	−0.001694	3,400
Pennsylvania	−0.000343	3,162
Rhode Island	−0.001603	1,198
South Carolina	−0.001217	2,921
South Dakota	−0.001105	554
Tennessee	−0.001344	4,782
Texas	−0.000360	4,205
Utah	−0.001493	1,608
Vermont	−0.001638	658
Virginia	−0.001165	4,846
Washington	−0.001525	4,913
West Virginia	−0.001406	2,081
Wisconsin	−0.001303	4,665
Wyoming	−0.001643	611

Standard error of a ratio. Certain estimates may be calculated as the ratio of two numbers. The standard error of a ratio, x/y, may be computed using

$$s_{x/y} = \frac{x}{y}\sqrt{\left[\frac{s_x}{x}\right]^2 + \left[\frac{s_y}{y}\right]^2 - 2r\frac{s_x s_y}{xy}} \qquad (6)$$

The standard error of the numerator, s_x, and that of the denominator, s_y, may be calculated using formula (2). Alternatively, use formula (1) and tables C-1 through C-4. In formula (6), r represents the correlation between the numerator and the denominator of the estimate.

For one type of ratio, the denominator is a count of families or households and the numerator is a count of persons in those families or households with a certain characteristic. If there is at least one person with the characteristic in every family or household, use 0.7 as an estimate of r. An example of this type is the mean number of children per family with children.

For all other types of ratios, r is assumed to be zero. If r is actually positive (negative), then this procedure will provide an overestimate (underestimate) of the standard error of the ratio. An example of this type of ratio is given the illustration below.

NOTE: For estimates expressed as the ratio of x per 100 y or x per 1,000 y, multiply formula (12) by 100 or 1,000, respectively, to obtain the standard error.

Illustration. Table 8 shows that 36.7 percent of the 19,145,000 people who completed 8 years or less of school voted in 1988. Table 8 also shows that 77.6 percent of the 33,604,000 people who completed 4 or more years of college voted in 1988. The ratio of the percentage for the college educated ($x = 77.6$) to the percentage for those educated 8 years or less ($y = 36.7$) is 2.11. Using formula (4) with $b = 3827$ from table C-5, the approximate standard error s_x for 77.6 percent is 0.4. The standard error s_y for 36.7 percent is 0.7 ($b = 3827$). Therefore

$$(s_x/x)^2 = 0.00003 \text{ and } (s_y/y)^2 = 0.0004.$$

Using formula (6) and $r = 0$, the standard error of the estimated ratio 2.11 is

$$s_{x/y} = (2.11)\sqrt{0.00003 + 0.0004} = 0.04$$

This means that the 90-percent confidence interval around the ratio is from 2.05 to 2.17, i.e., $2.11 \pm (1.6)(0.04)$.

Table C-9. **Census Division and Region Voting Parameters**

Area	a	b
Census Divisions:		
New England	−0.000221	2,146
Middle Atlantic	−0.000122	3,505
East North Central	−0.000114	3,543
West North Central	−0.000280	3,631
South Atlantic	−0.000117	3,495
East South Central	−0.000369	4,103
West South Central	−0.000207	3,964
Mountain	−0.000267	2,433
Pacific	−0.000244	6,237
Regions		
Northeast	−0.000082	3,161
Midwest	−0.000081	3,569
South	−0.000063	3,757
West	−0.000151	5,237
All except South	−0.000034	3,929